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Research Article

Generation of Oscillators using Transistors

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Abstract

In the present article a short introduction about astable multivibrator and its use to generate the clock signals are addressed. In this oscillating method consist of two NPN transistors .when a signal is given to base, transistor goes to conduction. Here the oscillating circuit is the capacitors that are coupled with their parallel transistors. The intensity and frequency of the output can be modified by carrying the resistance and capacitance respectively. The main advantage is we have two outputs in this kind of oscillator which makes it fit for various special applications such as blinker as well as a kind of invertor circuits. The output can either be taken from either led bulb, transformer, or into other circuits that needs an oscillating frequencies such as in communication technologies.

Keywords: Flip-flops; Function Generators; Bipolar Junction Transistors; Driver Circuit.

Introduction

A multivibrator is an electronic circuit used to implement a variety of simple two-state devices such as relaxation oscillators, timers and flip-flops (FF) [1-2]. It consists of two amplifying devices (transistor in this case) cross-coupled by resistors or capacitors. Its frequency range is 1.5 Hz to 715 kHz [3-4]. Two Bipolar Junction Transistors (BJT) are used in this Capacitors are either electrolytic or ceramic ones are used as per the frequency range [5]. It can be used in frequency generators (or) Function Generators (FG), it can be used in the decorative bulbs such as that one which are seen in front of many stores, it can be used in a part of inverter or even some invertor can be built out from it as it generates frequencies it can also be used in wireless power [6-8] transmissions, by setting its frequency exactly as 1 Hz it can be used in clocks and watches, in ambulance sirens and vehicle indicators it can be used. It can be used as Driver Circuit (DC) in dc motors [9-10].

Proposed system

Here the emitters of the transistors are coupled together where the negative end of the battery or the DC source is connected and the base is connected to the feedback circuit of the cross coupled transistor in between which a capacitor is connected for the delay so that the oscillation takes place.

The resistors connected to the led determine the brightness of the led and the other two resistors connected to the collector of the transistor determines the frequency. The end of the led positive and the collector which is connected to a minimal ohm resistor is connected at the positive (anode) of the battery (Fig. 1).

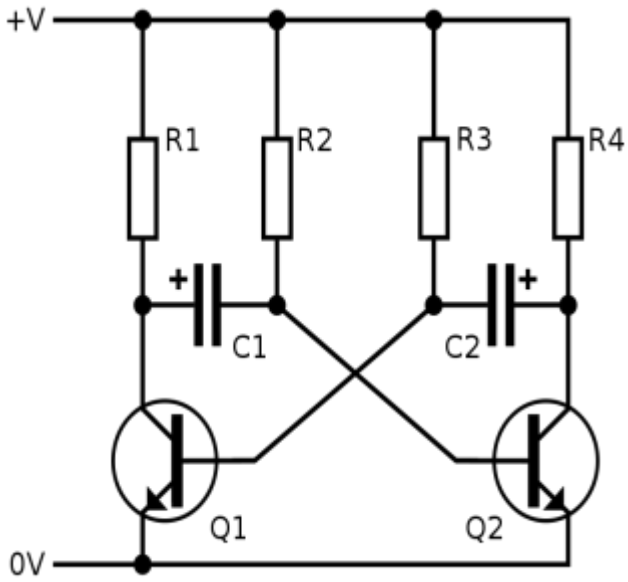

Fig. 1. Schematic of proposed oscillating circuit

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Result and discussion

It works in two stages first stage is where the transistor 1 Q-1 is switched on and transistor 2 Q-2 is switched off (Fig. 2). Simulation results of Q-1 is on and Q-2 is off is shown in Fig. 3. The second stage is where the transistor 2 Q-2 is switched on and transistor 1 Q-1 is switched off (Fig. 4). Simulation results of Q1 is off and Q-2 is on is shown Fig. 5.

One of the capacitor is charged partially through the resistor of the higher resistance from the power source. As the capacitor completely charges it gives a signal to the base of the parallel transistor. The signal lasts until the capacitor is completely discharged. And the signal makes the current flow through the other transistor simultaneously as soon as the capacitor is charged to its cutoff voltage 0.6v there by making the other led glow and the other capacitor starts getting charged. when this capacitor is completely discharged , the cutoff voltage of base is not obtained and the current stops flowing through the respected transistor but the parallel capacitor that is charged by the previous one makes the other transistor to work by providing the cutoff voltage to it when the capacitor is charged the cycle is repeated.

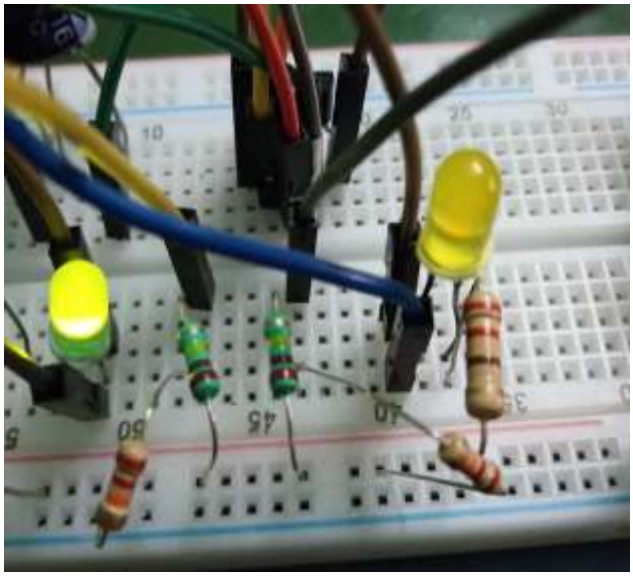

Fig. 2. Experimental results of Q-1 is on and Q-2 is off

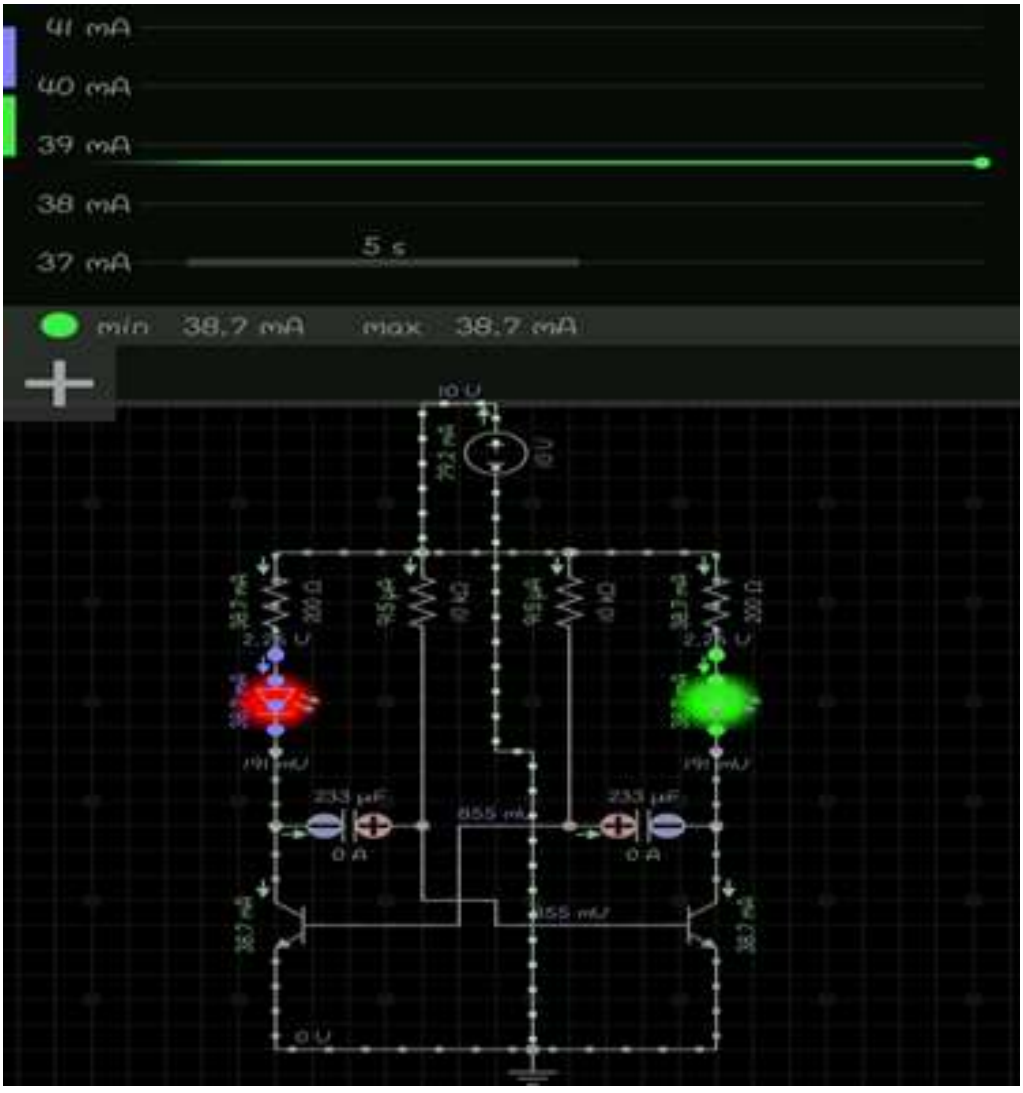

Fig. 3. Simulation results of Q-1 is on and Q-2 is off

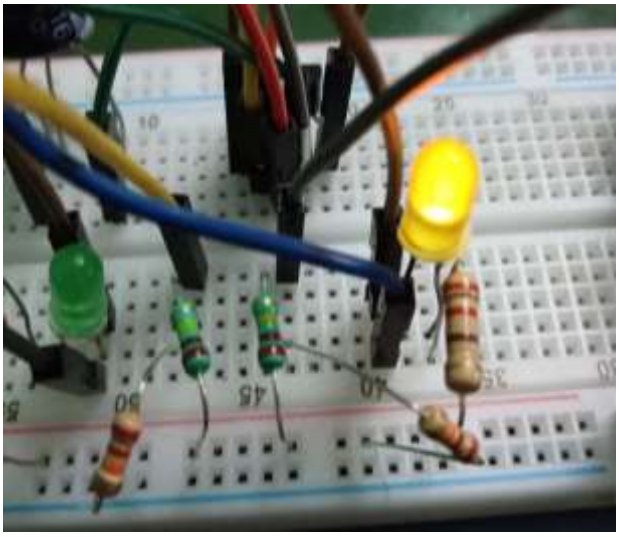

Fig. 4. Experimental results of Q-1 is off and Q-2 is on

Here the time period t=RC*ln*

Frequency f =1/t=1/2ln*(R2.Cl+R3.C1)

=1/0.693*(R2.Cl+R3.C1)

For the special case where

$t_1 = t_2$ (50% duty cycle) $R_2 = R_3$

$C_1 = C_2$ F=1\ln(2).RC.2 =0.72/RC

It can be used in frequency generators (or) function generators, it can be used in the decorative bulbs such as that one which are seen in front of many stores, it can be used in a part of invertor or even some invertors can be built out from it as it generates frequencies it can also be used in wireless power transmissions, by setting its frequency exactly as 1 Hz it can be used in clocks and watches, in ambulance sirens and vehicle indicators it can be used. It can be used as driver circuit in vice dc motors. Timers and flip flop circuits are made out from this. The value of resistors R2 and R3 should be 1000 times the resistance of R1 and R4. This is to be maintained to avoid noise.

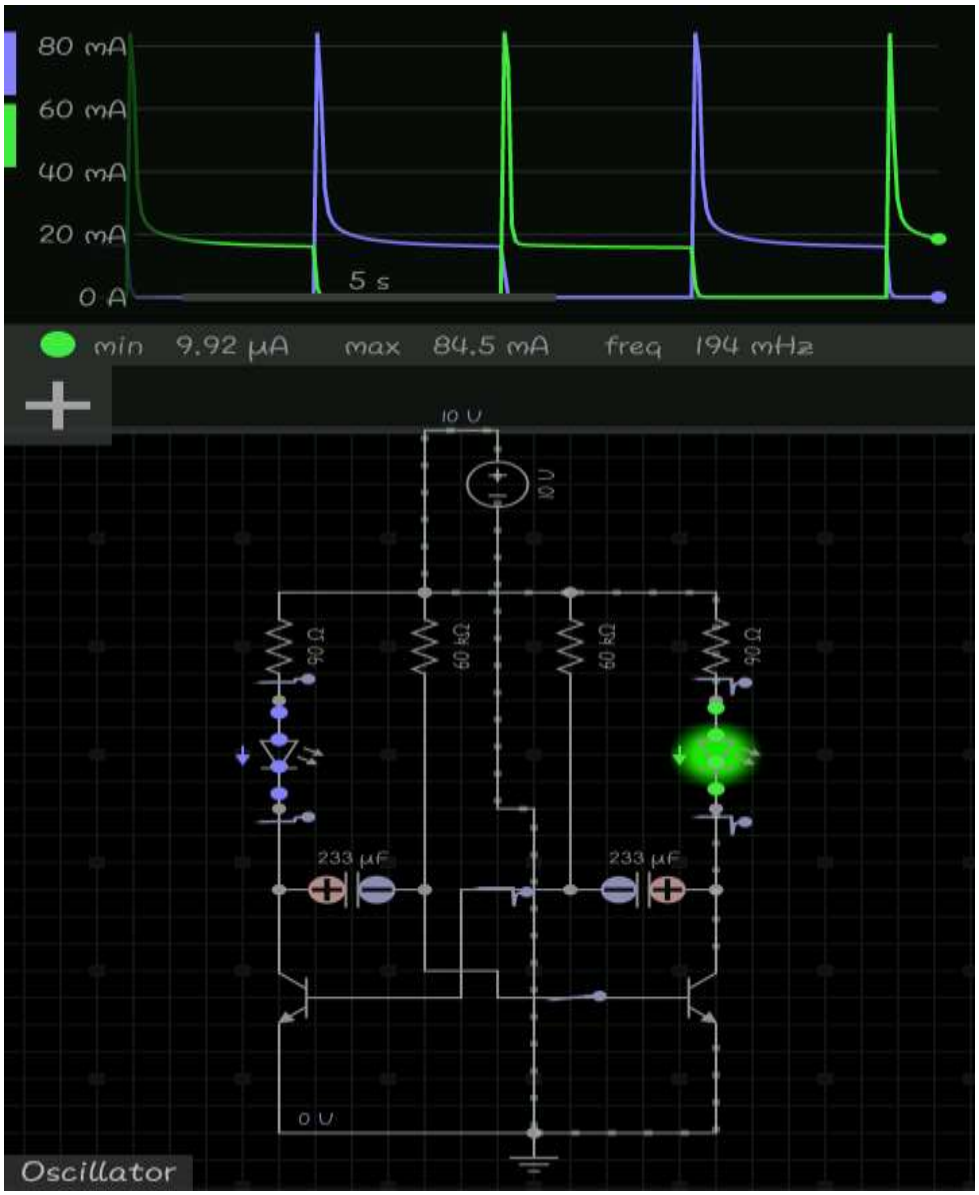

Fig. 5. Simulation results of Q-1 is off and Q-2 is on

For more high frequencies the noises can also be avoided by using a tank circuits (i.e. combination of capacitor and inductor in series). If the resistance of the R1 and R4 is lower, the capacitance or resistance of capacitors and resistors of a transistor can be kept constant and while changing them on the other side it gives a different kind of wave. Where the wave is having lesser or greater time period than the other or this can be said as when the resistance and capacitance of the two transistors are not the same the time period of the wave is also not the same. The oscillation does not takes place when the resonance is not in proportion Voltage distribution is not constant if resistor of a lower range is connected. Resistors are in the proportion and the capacitance is changed to vary the first half cycle of the oscillation. Both resistance and capacitance are varied to produce short period in the first half oscillation.

Conclusions

Thus the benefit of a transistor as a switch with a certain cutoff has been taken as an advantage coupling its trigger which is the base with a capacitor made it as an oscillator. Different biasing methods have been under taken and various outputs are observed. Collector to emitter current is regulated for various intensity and frequencies of outputs. This is built by any common NPN bipolar transistors here NPN 2n2222a transistor is used. The minimum frequencies generated are much slower which is nearly 20 mHz. And the maximum frequencies generated are as higher as 130 MHz with a lot of distortions.

Conflicts of Interest

Authors declare no conflict of interest

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